

REMARKS

Applicants have amended claims 1 and 2 and have added new claims 4-8 to further define their invention. In particular, claim 1 has been amended to recite that the apparatus includes at least one transfer unit for transferring the specimen from the dryer unit to the etching process unit, wherein said etching process unit can further perform in succession etching of the dried surface of the lamination layer including the NiFe or NiFeCo alloy with a high density gas plasma of a low ion energy while controlling the temperature of the specimen below 200 °C. New claims 5-8 recite that the apparatus includes at least one transfer means for transferring the specimen from the dryer unit to the etching process unit, wherein said etching process unit can further perform in succession etching of the dried surface of the lamination layer including the NiFe or NiFeCo alloy with a high density gas plasma of a low ion energy while controlling the temperature of the specimen below 200 °C. See, by way of example only, vacuum transfer unit 2 and atmospheric transfer unit 5 in, e.g., Figures 1 and 2.

Claim 1 stands rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,769,952 to Komino in view of U. S. Patent No. 5,334,251 to Nashimoto and U.S. Patent No. 6,048,435 to DeOrnellas et al. Applicants traverse this rejection and request reconsideration thereof.

The present invention relates to an apparatus capable of processing a specimen having two or more layers, at least one of which includes NiFe or NiFeCo alloy, the magnetic property of which is deteriorated if the specimen is heated above 230 °C, and which is laminated on a substrate. The apparatus

includes an etching process unit, which is supplied with a gas that can produce a high density gas plasma of a low ion energy with the gas and which can perform etching of the specimen laminated on the substrate, with the produced high density plasma gas while controlling the temperature of the specimen below 200°C, a rinsing unit including a rinsing cup that can perform rinsing with a liquid in the rinsing cup of an exposed surface by the etching of the lamination layer including the NiFe or NiFeCo alloy, so as to wash out substantial corrosive elements on the exposed surface, immediately after the etching, and a dryer unit including a hot plate that can perform drying of the rinsed surface of the lamination layer including the NiFe or NiFeCo alloy immediately after the rinsing thereof, by placing the lamination layer on the hot plate while controlling the temperature of the hot plate so as to keep the temperature of the specimen below 200 °C.

The apparatus also includes at least one transfer unit for transferring the specimen from the dryer unit to the etching process unit. In this manner, the etching process unit can further perform in succession etching of the dried surface of the lamination layer including the NiFe or NiFeCo alloy with a high-density gas plasma of a low ion energy while controlling the temperature of the specimen below 200 °C. By enabling the specimen to be removed from the etching unit, rinsed and dried, and then placed back into the etching unit, reaction products deposited on the etching sidewall can be removed to expose the surface to be etched so as to achieve a vertical etched profile.

The patent to Komino discloses a reduced pressure treatment unit comprising a plurality of treatment chambers conducting reduced pressure process treatment of a treatment object (wafer) and a normal pressure

treatment unit conducting normal pressure process treatment of the treatment object, which are connected by a load lock chamber. The reduced pressure treatment unit comprises a plurality of reduced pressure process treatment chambers connected by means of a gate valve to a reduced pressure transport chamber equipped with a robot arm. This patent indicates at column 6, lines 7-20 that:

FIG. 1 indicates an example of disposing the normal pressure process treatment chambers 18A, 18B, 18C and 18D as two sets of respective cleaning chambers 18A and 18C, and drying chambers 18B and 18D. As a result, prior to transporting the treatment objects into the reduced pressure process treatment chamber 10, the treatment objects can be cleaned with, for example, hydrofluoric acid or pure water in the cleaning chambers 18A and 18C, and dried in the drying chambers 18B and 18D. Also, after completion of treatment in the reduced pressure process treatment chambers 10A, 10B and 10C, the treatment objects can be cleaned with, for example, hydrofluoric acid or pure water in the cleaning chambers 18A and 18C, dried in the drying chambers 18B and 18D and returned to the wafer cassette.

Thus, the Komino patent discloses transporting the treatment objects from the cleaning chambers to the reduced pressure chambers before and after, not as an intermediate step during, treatment in the reduced pressure process treatment chambers. Thus, the Komino patent does not disclose and would not have suggested at least one transfer unit or means for transferring the specimen from the dryer unit to the etching process unit, as presently claimed, wherein the etching process unit can further perform in succession etching of the dried surface of the lamination layer including the NiFe or NiFeCo alloy with a high density gas plasma of a low ion energy while controlling the temperature of the specimen below 200 °C.

Moreover, the etching process unit of the present invention is defined as being capable of etching of the specimen under a low specimen temperature of below 200 °C by making use of a high density gas plasma with

a low ion energy and further, the hot plate is defined as performing drying at a temperature of below 200 °C immediately after the rinsing. Komino does not disclose that its apparatus is capable of performing etching or drying at a temperature of below 200 °C. Further, Komino does not disclose an apparatus having a drying unit that includes a hot plate that is controlled to keep the temperature of the specimen being dried to below 200 °C.

The Nashimoto patent discloses that the temperature of a substrate, such as a semiconductor wafer, is controlled in the processing of the substrate, such as sputtering, etching, deposition, or the like. According to the present invention, an accurately controlled temperature environment may be achieved by measuring the temperature and emissivity of heat from the surface of the substrate being processed, remotely as well as on a real-time basis, and correcting the temperature to reflect the actual temperature according to the emissivity as measured. However, this patent does not remedy any of the basic deficiencies of Komino noted above. That is, the Nashimoto patent does not disclose and would not have suggested at least one transfer unit or means for transferring the specimen from the dryer unit to the etching process unit, as presently claimed, wherein the etching process unit can further perform in succession etching of the dried surface of the lamination layer including the NiFe or NiFeCo alloy with a high density gas plasma of a low ion energy while controlling the temperature of the specimen below 200 °C. Moreover, the Nashimoto patent would not have suggested an apparatus having a drying unit that includes a hot plate that is controlled to keep the temperature of the specimen being dried to below 200 °C.

The DeOrnellas et al patent discloses a plasma etch reactor that includes a reactor chamber with a grounded upper electrode, a lower electrode which is attached to a high frequency power supply and a low frequency power supply, and a peripheral electrode which is located between the upper and lower electrode, and which is allowed to have a floating potential. Rare earth magnets are used to establish the magnetic field which confines the plasma developed within the reactor chamber. The plasma etch reactor is capable of etching emerging films used with high-density semiconductor devices. However, this patent does not remedy any of the basic deficiencies of Komino and Nashimoto noted above. That is, the DeOrnellas et al patent does not disclose and would not have suggested at least one transfer unit or means for transferring the specimen from the dryer unit to the etching process unit, as presently claimed, wherein the etching process unit can further perform in succession etching of the dried surface of the lamination layer including the NiFe or NiFeCo alloy with a high density gas plasma of a low ion energy while controlling the temperature of the specimen below 200 °C. Moreover, the DeOrnellas et al patent would not have suggested an apparatus having a drying unit that includes a hot plate that is controlled to keep the temperature of the specimen being dried to below 200 °C.

Accordingly, the presently claimed invention is patentable over the proposed combination of patents.

Claims 2 and 3 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,769,952 to Komino in view of U. S. Patent No. 5,334,251 to Nashimoto and U.S. Patent No. 6,048,435 to

DeOrnellas et al, and further in view of U.S. Patent No. 5,303,671 to Kondo et al and Japanese Patent Application Kokai No. 60-183996 to Kameyama.

Applicants traverse this rejection and request reconsideration thereof.

The Examiner has cited Kondo et al and Kameyama for allegedly teaching the use of rinsing cups and the Kondo et al patent for disclosing the use of a hot plate. However, these documents do not remedy the basic deficiency of Komino, Nashimoto and DeOrnellas et al noted above; that is, they do not disclose and would not have suggested at least one transfer unit or means for transferring the specimen from the dryer unit to the etching process unit, as presently claimed, wherein the etching process unit can further perform in succession etching of the dried surface of the lamination layer including the NiFe or NiFeCo alloy with a high density gas plasma of a low ion energy while controlling the temperature of the specimen below 200 °C. Accordingly claims 2 and 3 are patentable over the proposed combination of references.

In view of the foregoing amendments and remarks, favorable reconsideration and allowance of all the claims now in the application are requested.

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage in the fees due in

connection with the filing of this paper, including extension of time fees, to
Deposit Account No. 01-2135 (Case No. 503.38156VX1) and please credit
any excess fees to such deposit account.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Alan E. Schiavelli', written over a horizontal line.

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